Geophysical Research Abstracts
Vol. 17, EGU2015-14125, 2015
EGU General Assembly 2015

Atmospheric Halogen Chemistry of Volcanic Plumes in WRF-Chem

Luke Surl (1), Deanna Donohoue (2), and Roland von Glasow (1)

(1) University of East Anglia, School of Environmental Sciences, United Kingdom (l.surl@uea.ac.uk), (2) Lawrence University, Appleton, Wisconsin, 54911, USA

Volcanic eruptions are known to be a strong and concentrated source of reactive halogen species. The chemistry that these species are known to take part in include ozone-destruction cycles. Despite the potentially large perturbation to the chemistry of the troposphere that eruptions may cause, the magnitude of such impacts on global and regional scales is largely unknown.

We used WRF-Chem to investigate the influence of Mount Etna on the tropospheric chemistry of the Mediterranean region. The chemistry of bromine, chlorine and mercury has been added to the chemical mechanism CBMZ and we have coupled WRF-Chem with the emissions program PrepChem. We developed a simple parameterisation of the key multiphase reaction cycles involving halogens. Comparison with published field data shows that the model is able to reproduce the bromine explosion phenomenon seen in spectroscopic investigations of volcanic plumes.

From the model results we are able to determine a detailed picture of the chemistry of a volcanic plume; results are presented which show in detail how the character of the volcanic plume evolves as it is advected downwind and we identify which parts of the chemical cycle are most likely to be the limiting factors for the speed of the processing.

Additionally, these modelled results are supplemented with, and compared against, measurements of ozone depletion that we made within the plume at the summit of Mount Etna.